



# Teachers Learning Pack



## **Carbon footprint**

Activity plan Worksheets Resource Cards

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### Carbon

#### What are fossil fuels?

There are three major forms of fossil fuels: coal, oil and natural gas. All three were formed many millions of years ago during the time of the dinosaurs from the fossils, or remains, of dead animals and plants that were buried under dirt and rock. Heat from inside the earth and pressure from dirt and rock change these fossils into oil, natural gas and coal. Because it takes millions of years to make or "renew" more fossil fuels, we call them "nonrenewable fuels." Humans are currently using the fuels that were made more than 65 million years ago. Once this fuel is gone, it is gone for good.

#### **Carbon footprint**

When we use fossil fuels, like heating oil, to keep our house warm or petrol for our family's car, carbon dioxide is created (CO2). Carbon dioxide is a greenhouse gas. Many scientists believe that greenhouse gases are making the earth too warm. Our carbon footprint is the total amount of CO2 we create. A big carbon footprint means we areproducing a lot of CO2 and are having a bigger impact on the planet.

#### Carbon dioxide (CO2) is waste energy

Every time we use energy that comes from fossil fuels, we create CO2, increasing our carbon footprint. Think of CO2 as waste energy; it's what's created as we undertake our daily activities.

#### Electricity

The electricity we use in our home is the largest contributor to our carbon footprint. Although electricity doesn't create greenhouse gases at the time we use it, the power plants that make electricity using coal as the fossil fuel do, creating CO2.

#### Heating your home

Keeping warm in the winter is the second biggest source of CO2 and it contributes to our carbon footprint. Our houses use fossil fuels like oil, gas or electricity to run central heating systems to keep uswarm. The amount of CO2 our home creates dependson the type of fuel we use and how high we set our heating thermostat.

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#### Other sources of carbon dioxide

When we use the family car, it contributes to our family's overall carbon footprint. That's because a car uses petrol or diesel as fuel and creates CO2 as waste. Buses, trains and planes also create CO2. Our rubbish also contributes to our carbon footprint. Over time, rubbish produces CO2 and methane (another type of greenhouse gas) as it decomposes.

#### **Reducing your carbon footprint**

The best way to reduce our carbon footprint is to use less electricity and less fossil fuel. For example:

- Be sure to turn off the omputer when not in use
- Turn off the elevision and lights when not in use
- Lower the temperature in your home during the winter
- Use public transport instead of a car journey, or even better cycle or walk
- Reduce the amount of rubbish created by recycling and reuse items where possible.

#### Trees are a carbon store

Planting trees is an effective way to lower your carbon footprint. While they are growing, trees absorb carbon dioxide from the atmosphere through the process of photosynthesis and store it as carbon in the form of wood.

Whilst a tree is healthy and growing it will continue to hold on to the carbon and absorb more throughout its life. If the wood is used for building the carbon is 'locked away' until it is burned or allowed to rot.

Planting more trees also provides multiple benefit as part of the sustainable management of natural resources, providing habitats, food sources, shelter for wildlife, cleaning the air, stabilising soils and preventing flooding.



## **Carbon footprint**

Curriculum for Excellence Level	Second, Third		
Time needed for activity	30 – 45 minutes		
Location	Outdoor environment with access to a range of trees		

#### Context

This activity plan highlights the important role trees have in absorbing carbon dioxide from the atmosphere through photosynthesis storing it as carbon in the form of wood.

#### **Curriculum links**

Sciences: Energy sources and sustainability/Processes of the planet

Social studies: People, place and environment

#### Please note that this activity will also help deliver outcomes in of Literacy and English, and Mathematics.

Second	•	By considering examples where energy is conserved, I can identify the energy source, how it is transferred and ways of reducing wasted energy. SCN 2-04a SOC 2-08a	•	Through exploring non-renewable energy sources, I can describe how they are used in Scotland today and express an informed view on the implications for their future use. <b>SCN 2-04b</b>
Third	•	By contributing to experiments and inveigations, I can develop my understanding of models of matter and can apply this to changes of state and the energy involved as they occur in nature. SCN 3-05a SOC 3-08a	•	I can explain some of the processes which contribute to climate change and discuss the possible impact of atmospheric change on the survival of living things. <b>SCN 3-05b</b>

#### **Additional resources**

Forests for the future: a resource investigating trees, forests and climate change www.forestsforthefuture.co.uk

Forests for the Future is designed for upper primary learners to explore the local and global issues surrounding climate change and sustainable development. There is a focus on the role that trees, forests, and people can play in reducing and/or mitigating any negative impacts.

The Forests for the Future resource seeks to encourage teachers and their learners outdoors - using local trees, parks and woodland areas (private and public) to help understand climate change issues, the value of trees in the carbon cycle, and what individuals and schools can do to make a difference.



#### **Objectives**

#### By the end of this activity learners will be able to:

- work out their carbon footprint using measurement, calculations and a graph
- measure how much carbon is stored in trees
- explain the important role of trees in storing carbon

#### **Equipment and resources** consider how to make changes to reduce their carbon footprint

- Information note Carbon
- Resource cards Carbon footprint
- Worksheet Carbon footprint
- Clipboards
- Pencils
- Tape measures
- Calculators
- Tree ID sheets, apps or books

#### What to do

- 1 Spread out the footprint cards in an area (if necessary, weigh down e.g. stones, tie to trees, etc).
- 2 Discuss what a carbon footprint is and how our everyday activities emit carbon see Information Note - Carbon.
- 3 Learners can work individually, in pairs or small groups (footprints should be calculated based on the activities of one member of the group or pair or agree an average representative figure.
- 4 Distribute worksheets, clipboards and pencils.
- **5** Learners can follow the step by step instructions on the worksheet to calculate their annual carbon footprint. By locating and replacing the scattered carbon footprint resource cards learners can complete the missing values in the first column on their work sheet.
- 6 Having calculated their total annual carbon emissions, learners can follow the instructions on the worksheet to find a tree that stores that amount of carbon.
- 7 A separate calculation allows learners to work out how long it has taken for their chosen tree to absorb their annual carbon emission, i.e. the age of the tree.
- 8 Compare results by asking learners to order themselves in a line from highest carbon footprint to the lowest. Discuss how everyone, especially those with higher carbon footprints could reduce their impact by making changes in their everyday lives.

#### **Key questions**

- What is a carbon footprint?
- What might contribute to our carbon footprint?
- How are trees connected to our carbon emissions?
- How can we reduce our carbon footprint?







• Hide or spread the Resource cards -Carbon

• Learners to work through worksheets

• Complete worksheet without calculators.

footprint over a larger area.

More able

independently.

#### Adapting for different needs/abilities

#### Less able

- Go through worksheet step by step using yourself as an example.
- Complete the worksheet as a group: leader to use an average for each of the activities following discussions with the group.
- Break down each stage of the worksheet and check results and understanding before moving onto the next stage.

#### Follow up activity/extension

- Calculate the carbon footprint of a household, whole school, etc.
- Put an action plan in place to reduce the calculated carbon footprint.

Try our other Trees and Woodlands activity plans:

- Activity plan Seed dispersal
- Activity plan Tree planting
- Activity plan Carbon storage calculator

#### Additional information

See Information note - Carbon

Thank you to Natural Resources Wales for sharing this resource with Outdoor & Woodland Learning Scotland



## **Carbon footprint**

As trees grow they take in carbon dioxide and store carbon in their trunks, roots and leaves. Can you find a tree that has absorbed the same amount of carbon that your actions have emitted in a year?

#### Step 1

- Use the table below to calculate your carbon emissions for one year by using the resource cards to complete the missing values in the green column below.
- Follow the example to complete the rest of the table to calculate your carbon emissions for one year.

Activity	Carbon Emitted per activity (g)	How many times on an average day?	Carbon emissions per day (g)
EXAMPLE Television per hour	25	3	25 x 3 = 75
Television per hour			
Lights for 1 room per hour			
Computer / laptop per hour			
Radio per hour			
Games Console (eg Xbox360) per hour			
Hairdryer for 10 minutes			
Car journey for 1 mile			
Electric Oven for 15 minutes			
Boiling kettle once			
Making 2 slices of toast			
Using a microwave for 1 minute			
1 cycle of dishwasher			
Washing machine at 40 degrees	Based on 1 pile	118	
Tumble drier	Based on 1 use per wk		74
Running a fridge freezer	Runs for 24 hours a day		500
TOTAL carbon omissions for 1 day	<i>a</i>		
Convert arome (n) to kile arome (l	9		
Convert grams (g) to kilograms (l	Kg		

x 365 days for TOTAL carbon emissions or carbon footprint for 1 year





kg



Worksheet

#### Step 2

- Once you know your carbon emissions for the year, use the graph provided to estimate the size of tree it would take to store that amount of carbon.
- Find your total carbon stored in kilograms along the 'x' axis and draw a straight line up to the green line. Read across to the 'y' axis to find the ci cumference of the tree you are going to look for.
- Measure different trees at chest height (1.3 meters off the ground) until you find one with a similar circumference.

#### **Circumference of tree that equates to my annual carbon emission**

#### Step 3

- Work out how long it has taken for your chosen tree to absorb your annual carbon emission i.e. the age of the tree.
- Different types of trees have different growing rates; conifer trees grow faster than broadleaf trees. Is your tree a conifer or a broadleaf?

#### **Broadleaf or Conifer?**

To calculate the age of a tree, divide the circumference (cm) by the growth rate (cm/yr)

- Divide by 3 for a conifer tree
- Divide by 2 for a broadleaf tree

You now know your annual carbon emissions can be absorbed by a tree that is

Imagine how many trees will be needed to absorb your carbon emissions over your lifetime.

What can you do to reduce your carbon footprint?

I will reduce my carbon footprint by:



### **Carbon footprint**

As trees grow they take in carbon dioxide and store carbon in their trunks, roots and leaves. Can you find a tree that has absorbed the same amount of carbon that your actions have emitted in a year?

#### Step 1

cm

Years old

years of age.

- complete the missing values in the green column below.
- Follow the example to complete the rest of the table to calculate your carbon emissions for one year.

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Running a fridge freezer	Runs for 24 hours a day		500
TOTAL carbon emissions for 1 day	g		
Convert grams (g) to kilograms (l	kg		
x 365 days for TOTAL carbon em	ka		

• Use the table below to calculate your carbon emissions for one year by using the resource cards to



Worksheet



(0,0)

Radio per

Games Console

Hairdryer for

29g

**10 minutes** 

28g

(e.g. Xbox 360)

per hour

**B01** 

hour





















3



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